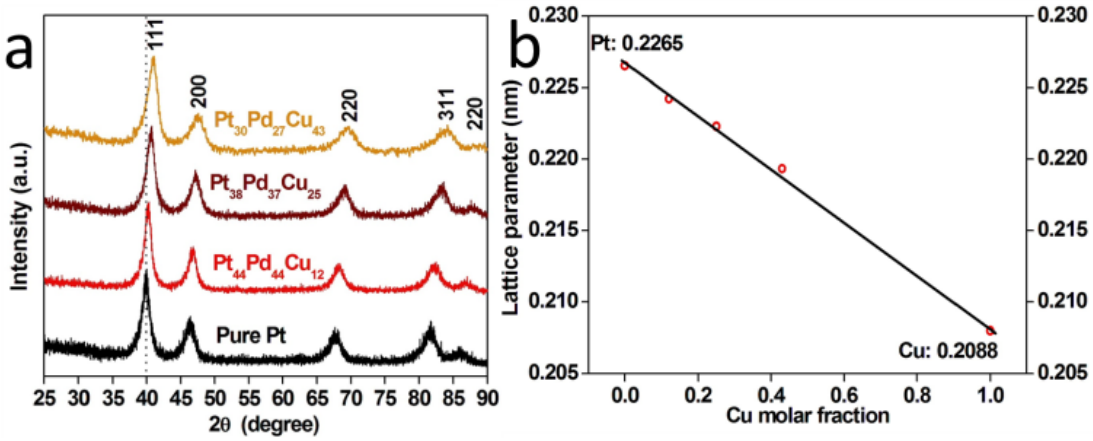


**Figure S1** (a) Wide-angle XRD patterns of the pure Pt and ternary nanoporous PtPdCu spheres with different molar ratios of Cu and (b) the relationship of the (111) diffraction angles *vs.* Cu molar fractions in ternary nanoporous PtPdCu.

**Comment to Figure S1:** Because of high close lattice match between Pd and Pt (lattice mismatch of only 0.77%) [H. Zhang *et al.*, *J. Am. Chem. Soc.* **2011**, *133*, 10422; B. Lim *et al.*, *Science* **2009**, *324*, 1302-1305; L. Wang *et al.*, *J. Am. Chem. Soc.* **2013**, *135,* 16762-16765], we use the lattice parameter values of Pt and Cu (do not consider the lattice parameter values of Pd ) to obtain the **Figure S1b**.

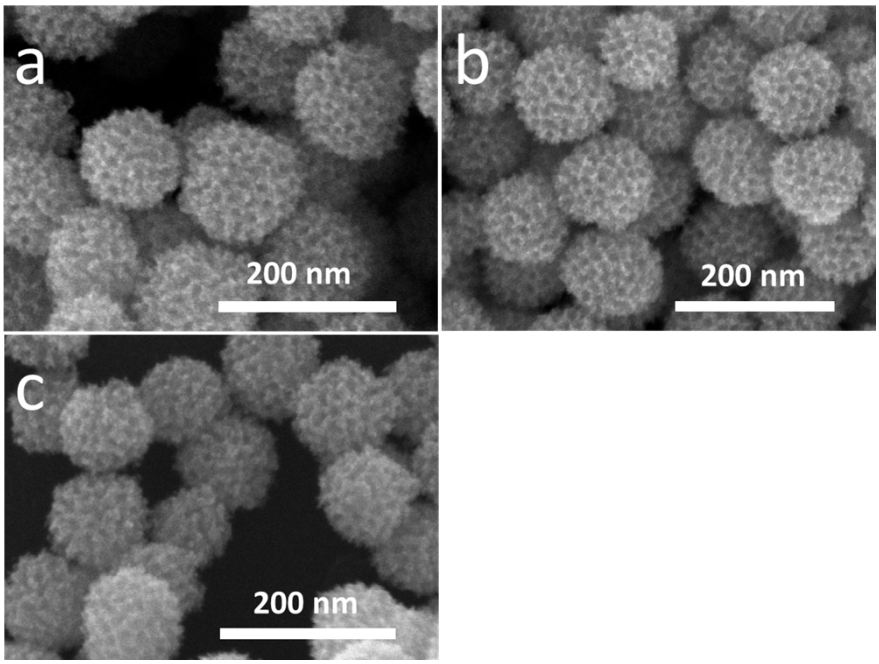


**Figure S2.** SEM images of the ternary nanoporous PtPdCu spheres with different amount of Cu: (a) nanoporous $Pt_{44}Pd_{44}Cu_{12}$ spheres, (b) nanoporous $Pt_{38}Pd_{37}Cu_{25}$ spheres, and (c) nanoporous $Pt_{30}Pd_{27}Cu_{43}$ spheres, respectively.

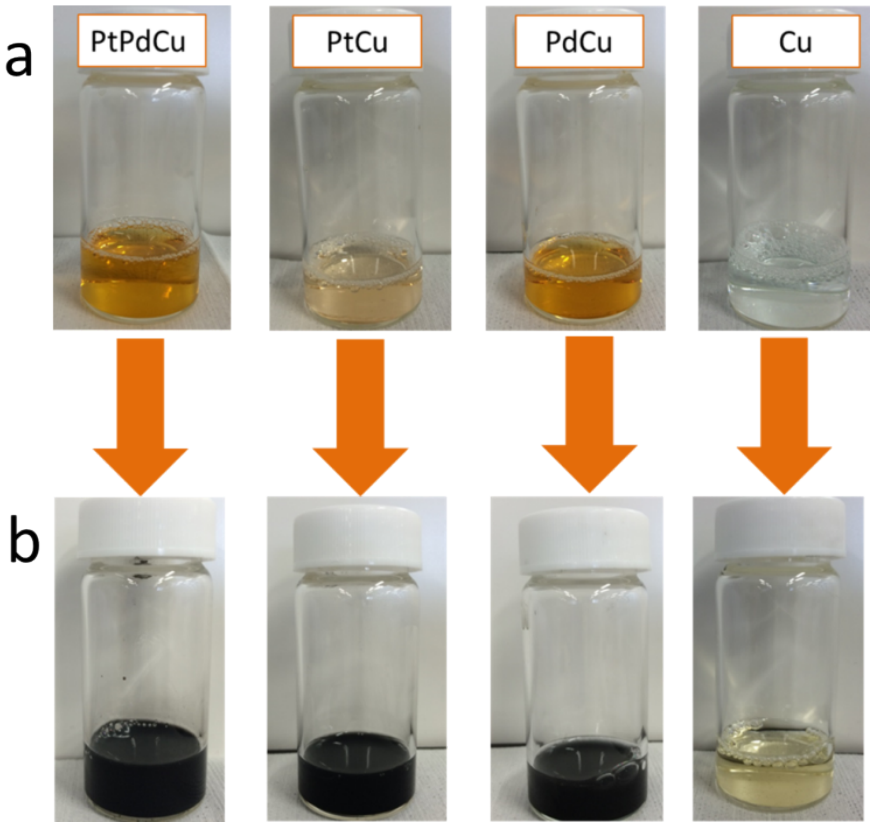


**Figure S3.** Photographs of different precursors (a) before and (b) after reduction reaction.

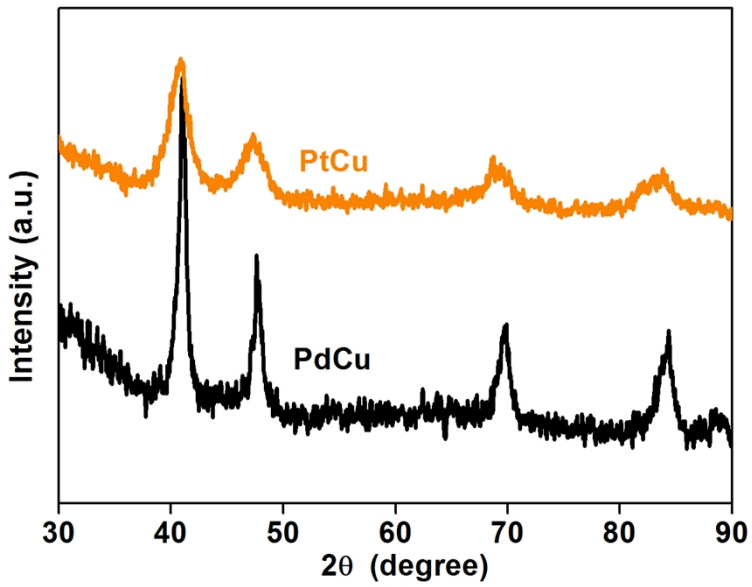


**Figure S4**. XRD patterns of binary PtCu and binary PdCu nanostructure obtained in **Figure S3**.

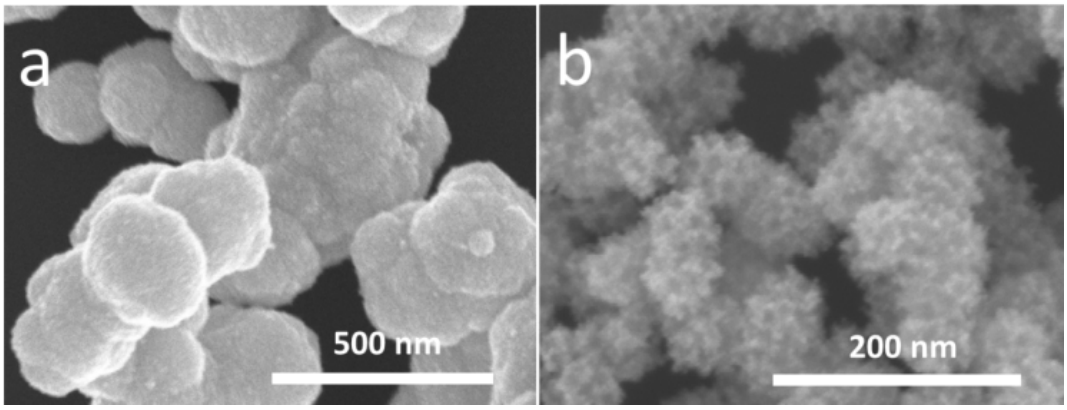


**Figure S5.** SEM images of samples prepared from the mixed precursor solution (a) without F127, and (b) with 3.0 mg F127

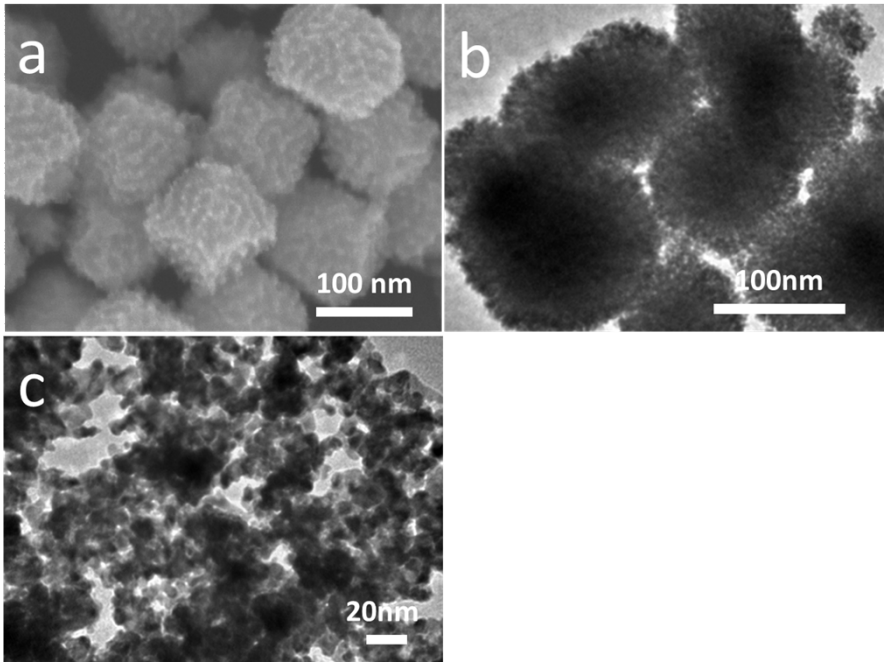


**Figure S6.** (a) SEM image of nanoporous PtPd and (b and c) TEM images of dendritic Pt nanoparticle and Pt black, respectively.

**Table S1**. Comparsion of the activity of ternary nanoporous PtPdCu spheres with previous reported Pt-based catalysts.

| Sample name | Condition | Scan rate ($mV\ s^{-1}$) | Surface area ($m^2\ g^{-1}$) | Mass activity ($A\ mg^{-1}\_Pt$) | Specific activity ($mA\ cm^{-2}$) | Ref. |
|---|---|---|---|---|---|---|
| Nanoporous PtPdCu | 0.5M $H_2SO_4$+ 0.5M $CH_3OH$ | 50 | 63.5[a] | 0.43 | 1.38[b] | Present work |
| Core-shell Au@Pt | 0.5M $H_2SO_4$+ 0.5M $CH_3OH$ | 50 | 34[a] | 0.12 | -- | S1 |
| Dendritic PtNiP | 0.5M $H_2SO_4$+ 0.5M $CH_3OH$ | 50 | -- | 0.36 | 0.65 | S2 |
| Core-shell Ag@Pt | 0.5M $H_2SO_4$+ 0.5M $CH_3OH$ | 50 | -- | 0.15 | -- | S3 |
| Dendritic PtCu | 0.5M $H_2SO_4$+ 1M $CH_3OH$ | 50 | 23.5[c] | *ca.* 0.34 | ca.1.42 | S4 |
| Core-shell Pd@Pt | 0.1M $HClO_4$+ 0.5M $CH_3OH$ | 50 | -- | *ca.*0.35 | -- | S5 |
| Concave PtPdCu | 0.1M $HClO_4$+ 1M $CH_3OH$ | 50 | -- | ca.0.16 | ca.12 | S6 |
| Yolk-shell PtCu | 0.5M $H_2SO_4$+ 2M $CH_3OH$ | 50 | -- | -- | 2.8 | S7 |
| Mesoporous PtCo | 0.5M $H_2SO_4$+ 0.5M $CH_3OH$ | 50 | 48.7[c] | 0.23 | -- | S8 |

[a] The surface area is measured by the BET method from the nitrogen isotherm

[b] The specific activity is the activity normalized by the electrochemical surface area (ECSA). The ECSA of ternary nanoporous PtPdCu spheres is calculated by integrating the charges associated with the reduction of monolayer metal oxide in cyclic voltammograms.[S9, S10] The ECSAs of ternary nanoporous PtPdCu spheres, binary nanoporous PtPd, dendritic Pt nanoparticles, and PtB in our study are 30.4, 25.1, 18.2, and 13.5 $m^2\ g^{-1}$, respectively.

[c] The surface area is ECSA, which is calculated by electrochemical methods.

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